Claims

We claim:

1. A method for increasing the resistance of a plant to an environmental stress condition, said method comprising introducing a polynucleotide into said plant, wherein said polynucleotide comprises a coding region that encodes a polypeptide that produces, catalyzes the synthesis of, or results in the production of maltose or a maltose alcohol.

2. The method according to claim 1, wherein said environmental stress condition is selected from the group consisting of thermal stress, water stress, and salt stress.

3. The method according to claim 1, wherein said thermal stress is heat stress.

4. The method according to claim 1, wherein said thermal stress is cold stress.

5. The method according to claim 1, wherein said polynucleotide encodes an enzyme selected from the group consisting of α-amylase, a β-amylase enzyme, starch phosphorylase, and starch debranching enzyme (DBE), or an enzymatically active fragment thereof.

6. The method according to claim 5, wherein said β-amylase enzyme exhibits reduced inhibition by maltose.

7. The method according to claim 5, wherein said β-amylase enzyme is thermostable.

8. The method according to claim 1, wherein said polypeptide encoded by said polynucleotide comprises an amino acid sequence that targets said polypeptide for chloroplast localization.

9. The method according to claim 1, wherein said polynucleotide comprises a promoter sequence operably linked to said coding region of said polynucleotide.

10. The method according to claim 9, wherein said promoter is an inducible promoter.

11. The method according to claim 10, wherein said inducible promoter is induced by an environmental stress condition selected from the group consisting of heat stress and cold stress.

12. The method according to claim 11, wherein said heat stress inducible promoter is a promoter selected from the group consisting of an *Hsp70*, *Hsp101*, and *Hsp17.6* promoter.

13. The method according to claim 11, wherein said cold stress inducible promoter is a promoter selected from the group consisting of a *Cor78*, *Cor15b*, and galactinol synthase promoter.

14. The method according to claim 9, wherein said promoter drives increased expression of said coding region of said polynucleotide.

15. The method according to claim 1, wherein said plant is a monocot.

16. The method according to claim 15, wherein said monocot is selected from the group consisting of rice, wheat, barley, oats, rye, sorghum, maize, lilies, banana, pineapple, turfgrass, gladiolus, and millet.

17. The method according to claim 1, wherein said plant is a dicot.

18. The method according to claim 17, wherein said dicot is selected from the group consisting of cotton, peas, alfalfa, chickpea, chicory, clover, kale, lentil, prairie grass, soybean, tobacco, potato, sweet potato, radish, cabbage, rape, apple trees, coffee, tomato, melon, citrus, beans, roses, sugar beet, squash, peppers, strawberry, carnation, chrysanthemums, impatiens, eucalyptus, and lettuce.

19. The method according to claim 1, wherein said polypeptide is overexpressed in said plant upon exposure of said plant to said environmental stress condition relative to a plant wherein said polynucleotide has not been introduced.

20. A plant, plant tissue, or plant cell transformed with or bred to contain a polynucleotide that comprises a coding region that encodes a polypeptide that produces, catalyzes the synthesis of, or results in the production of maltose or a maltose alcohol, wherein expression of said polynucleotide in said plant, plant tissue, or plant cell increases the resistance of said plant, plant tissue, or plant cell to an environmental stress condition.

21. The plant, plant tissue, or plant cell according to claim 20, wherein said environmental stress condition is selected from the group consisting of thermal stress, water stress, and salt stress.

22. The plant, plant tissue, or plant cell according to claim 20, wherein said thermal stress is heat stress.

23. The plant, plant tissue, or plant cell according to claim 20, wherein said thermal stress is cold stress.

24. The plant, plant tissue, or plant cell according to claim 20, wherein said polynucleotide encodes an enzyme selected from the group consisting of α-amylase, a β-amylase enzyme, starch phosphorylase, and starch debranching enzyme (DBE), or an enzymatically active fragment thereof.

25. The plant, plant tissue, or plant cell according to claim 24, wherein said β-amylase enzyme exhibits reduced inhibition by maltose.

26. The plant, plant tissue, or plant cell according to claim 24, wherein said β-amylase enzyme is thermostable.

27. The plant, plant tissue, or plant cell according to claim 20, wherein said polypeptide encoded by said polynucleotide comprises an amino acid sequence that targets said polypeptide for chloroplast localization.

28. The plant, plant tissue, or plant cell according to claim 20, wherein said polynucleotide comprises a promoter sequence operably linked to said coding region of said polynucleotide.

29. The plant, plant tissue, or plant cell according to claim 28, wherein said promoter is an inducible promoter.

30. The plant, plant tissue, or plant cell according to claim 29, wherein said inducible promoter is induced by an environmental stress condition selected from the group consisting of heat stress and cold stress.

31. The plant, plant tissue, or plant cell according to claim 30, wherein said heat stress inducible promoter is a promoter selected from the group consisting of an *Hsp70*, *Hsp101*, and *Hsp17.6* promoter.

32. The plant, plant tissue, or plant cell according to claim 30, wherein said cold stress inducible promoter is a promoter selected from the group consisting of a *Cor78*, *Cor15b*, and galactinol synthase promoter.

33. The plant, plant tissue, or plant cell according to claim 28, wherein said promoter drives increased expression of said coding region of said polynucleotide.

34. The plant, plant tissue, or plant cell according to claim 20, wherein said plant is a monocot.

35. The plant, plant tissue, or plant cell according to claim 34, wherein said monocot is selected from the group consisting of rice, wheat, barley, oats, rye, sorghum, maize, lilies, banana, pineapple, turfgrass, gladiolus, and millet.

36. The plant, plant tissue, or plant cell according to claim 20, wherein said plant is a dicot.

37. The plant, plant tissue, or plant cell according to claim 36, wherein said dicot is selected from the group consisting of cotton, peas, alfalfa, chickpea, chicory, clover, kale, lentil, prairie grass, soybean, tobacco, potato, sweet potato, radish, cabbage, rape, apple trees, coffee, tomato, melon, citrus, beans, roses, sugar beet, squash, peppers, strawberry, carnation, chrysanthemums, impatiens, eucalyptus, and lettuce.

38. The plant, plant tissue, or plant cell according to claim 20, wherein said polypeptide is overexpressed in said plant upon exposure of said plant to said environmental stress condition relative to a plant wherein said polynucleotide has not been introduced.

39. A plant grown from a plant tissue or plant cell of claim 20.

40. A protein comprising an amino acid sequence having α-amylase, β-amylase, starch phosphorylase, or starch debranching enzyme activity, and operably linked thereto, a heterologous amino acid sequence that targets said protein for chloroplast localization.